Reprinted from RISK Special Report (Incisive Media), July 2003

SPONSOR'S STATEMENT

HEAT™: A framework for evaluating hedge effectiveness

IAS 39 and FAS 133 are forcing corporations to perform numerical effectiveness tests on their derivative hedges. Here, JPMorgan describes a toolkit to help navigate the pitfalls and complexities of implementing appropriate tests

While it appears straightforward in theory, evaluating hedge effectiveness under the new derivatives accounting standards, FAS 133 and IAS 39, is fraught with pitfalls. The implementation guidance provided by the standards is limited, and even accountants admit that the practical development and interpretation of appropriate hedge effectiveness tests is far from clear cut. Furthermore, seemingly minor aspects in the design of the tests can have a significant impact on hedge effectiveness results. Corporations must therefore design their hedge effectiveness tests carefully to ensure that the economic reality of the hedging relationship is aligned as closely as possible with the accounting requirements.

Both IAS 39 and FAS 133 have dramatically changed the accounting treatment of financial derivatives

In order to help corporations circumvent these pitfalls and address the challenges provided by the accounting standards, JPMorgan has published its "Hedge Effectiveness Analysis Toolkit" (HEAT). This is the latest in a long history of cutting-edge risk management solutions developed by JPMorgan, that began with RiskMetrics back in 1994. HEAT provides a publicly-available framework to help corporations navigate the complexities of hedge effectiveness and hedge accounting. Its purpose is to guide corporate risk management strategy towards a more appropriate balance between economic and accounting performance in order to maximise financial flexibility and shareholder value.

HEAT comprises two distinct elements:

- HEAT Framework: a consistent framework for evaluating hedge effectiveness. This is published in the HEAT Technical Document, which is publicly available from our website.
- HEAT Software: a practical Web-enabled software tool. At present this is used by JPMorgan's clients for performing effectiveness tests on transacted hedges.

Our objectives in publishing HEAT in the public domain are to raise awareness of the issues connected with hedge effectiveness testing, and to improve the communication between corporate treasuries, accountants, auditors and investment banks. HEAT is the product of working with clients, auditors and accountants on risk management and accounting issues connected with the new standards over many years. It is not a prescriptive approach that proposes just one methodology, but rather an open and flexible framework that encompasses alternative methodologies to address the wide range of different hedging situations. Furthermore, HEAT will continue to evolve to embrace new methodologies and new types of analysis to fit the changing risk management needs of corporations, as well as future changes in accounting standards.

It is important to note that HEAT is not intended to provide a judgement on the appropriateness of any methodology for hedge effectiveness testing from an accounting perspective. Ultimately it will be the company's auditor that signs off on the methodology.

The need to evaluate hedge effectiveness

Both IAS 39 and FAS 133 have dramatically changed the accounting treatment of financial derivatives. Derivatives must now be held on the balance sheet at fair value. Furthermore, unless a derivative is a bona fide hedge and qualifies for hedge accounting treatment, the changes in its fair value can create additional earnings volatility. For bona fide hedges

this additional earnings volatility can be avoided, but only if the hedge qualifies for 'hedge accounting treatment'. Hedge accounting treatment allows corporations to match changes in the fair value of the derivative with those associated with the underlying hedged item, and recognise any net ineffectiveness in the income statement in the same period. For highly effective hedges, these changes in fair value will largely (or completely) offset each other, leading to significantly lower earnings volatility.

In order to qualify for hedge accounting, and thereby avoid unwanted earnings volatility, a derivative must be formally designated as a hedge at inception and (except in strictly limited circumstances under FAS 133) the effectiveness of the hedging relationship must be regularly evaluated and verified with a numerical effectiveness test.

However, putting hedge effectiveness testing into practice is not straightforward for several reasons. First, the accounting standards provide considerable flexibility in how hedge effectiveness tests are designed and implemented. While this leeway is essential to align the test with the company's risk management strategy, the lack of explicit implementation guidance provides insufficient direction for all but the most sophisticated corporations. Secondly, the high level of complexity attached to the standards, together with considerable uncertainties concerning implementation and interpretation, have made it difficult to identify hedge effectiveness methodologies that are consistent with the accounting standards and yet still sensible in economic terms. Third, it is easy to end up with inappropriate effectiveness tests by overlooking small, but significant, elements in the testing methodology.

The HEAT Framework

The HEAT framework, in line with the need for flexibility acknowledged by IAS 39 and FAS 133, incorporates alternative methodologies for evaluating hedge effectiveness. This allows corporations to select the methodology best fitted to the particular hedging situation and its corporate risk management strategy. It provides guidance on the following issues:

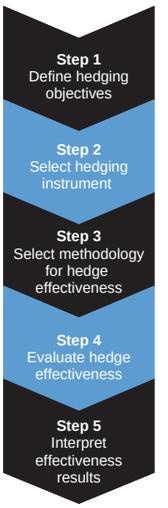
- ☐ How to approach hedge effectiveness
- ☐ How to select an appropriate effectiveness methodology
- ☐ What are the pitfalls that need to be avoided?
- ☐ Is hedge accounting necessary?
- ☐ Does the economic benefit of hedging outweigh the accounting impact?

A key element in the HEAT framework is the concept of the Ideal Designated-Risk Hedge (IDRH). The IDRH is the perfect (or ideal) hedge of a particular underlying hedged item with respect to a designated risk. The IDRH plays a vital role in validating the economic appropriateness of different hedge effectiveness methodologies. If under a given methodology for hedge effectiveness the IDRH gives a low effectiveness result, then that methodology is likely to be flawed from an economic perspective. Hence the IDRH is a practical tool to help guide the selection of an appropriate methodology for hedge effectiveness testing.

The Five Framework Steps

The HEAT framework has five main steps (see figure 1), which can be applied to any hedging application. The framework provides a structure upon which to implement a coherent and appropriate programme for assessing the effectiveness of different kinds of hedges. Although it has been motivated by the accounting standards, it is based on very general principles and incorporates a significant amount of flexibility.

Figure 1. The HEAT framework



Step 1 in the HEAT framework involves careful definition and documentation of hedging objectives. This includes first defining the underlying hedged item and then the designated risk to be hedged. A clear specification of the designated risk is particularly important, involving four main elements:

- ☐ Performance metric: eg, fair value or cashflow
- ☐ Risk class: eg, interest rate risk, foreign exchange risk, commodity price risk, etc
- ☐ Amount of the underlying being hedged: how much of the underlying exposure is being hedged?
- ☐ Desired risk characteristics: this refers to the risk characteristics which are desired after hedging, eg, for a fair value hedge of interest-rate risk, the desired risk characteristics might be 3-month Libor, or 6-month Libor-in-arrears, etc

Step 2 involves defining the hedging instrument and the hedge ratio. The hedge ratio determines how many units of the hedging instrument are used to hedge one unit of the underlying. Ideally, one should select the optimal hedge ratio, corresponding to the maximal reduction in risk.

Step 3 involves selecting the methodology for evaluating hedge effectiveness. This is in many ways the most important and challenging step in the HEAT framework, since an inappropriate choice of methodology can lead to spurious and misleading hedge effectiveness results. The choice of methodology comprises seven different dimensions:

1. Reference exposure: Should the hedging instrument be compared to the underlying hedged item or to the Ideal Designated-Risk Hedge (IDRH)?
2. Fair value approach: how should changes in fair value be evaluated? Use the full MTM value? Exclude accrued interest? Exclude changes in credit spread? Exclude forward premium? Etc
3. Historical data to be used: how much history? What data frequency and how many data points?

4. Method of applying historical data: how should historical data be used to create prospective or retrospective scenarios?
5. Maturity treatment: should one keep the maturities constant or allow the maturities to 'roll', ie, fall over time?
6. Basis for comparison: should one use cumulative changes or period-to-period changes in fair value?
7. Type of effectiveness test: regression test, or dollar-offset test, or risk reduction test, or another type of test?

Changing any one of these corresponds to a different methodology and changes the nature of the effectiveness test.

For example, the choice of fair-value approach can make a huge difference to test results. Even for the very simple case of a plain vanilla interest-rate swap providing a fair value hedge of the interest-rate risk on a fixed-rate bond, the choice to include or exclude accrued interest can make the difference between passing and failing the test.

Choosing different "types" of effectiveness tests can also lead to conflicting test results. In particular, the simplest and most widely discussed type of test, the so-called "dollar-offset" test, produces many more fail results than other types of test, such as regression and risk reduction, even for very highly correlated hedges. This high frequency of fails reflects the known extreme statistical properties of the test and inevitably leads to conclusion that the dollar-offset is fundamentally flawed.

Different combinations of these seven choice dimensions are appropriate for different hedging situations, and the HEAT Technical Document provides guidance in making relevant choices.

Step 4 in the HEAT framework is the implementation step, which means actually evaluating the effectiveness test, as defined by the methodology selected in the previous step. This step is conceptually very simple, but it is typically extremely time-consuming to perform. It involves first using historical data to generate scenarios for prospective and/or retrospective testing, then evaluating the changes in fair value in each scenario, and finally actually performing the test.

Step 5 in the HEAT framework is one of interpretation. The effectiveness results need to be interpreted in the context of the hedging objectives set out in Step 1. This interpretation is usually facilitated by defining "effectiveness thresholds", which provide an easy translation of the numerical results into a "pass" or "fail" signal. Different types of tests have different types of thresholds. Note, however, that the linkage between effectiveness thresholds and the true level of effectiveness of a given hedge is highly dependent on the effectiveness methodology, in particular, how much historical data is used, and what type of test is being performed. Hence caution needs to be exercised in setting appropriate threshold levels for different tests in different hedging situations.

Figure 2. Dollar-offset test result

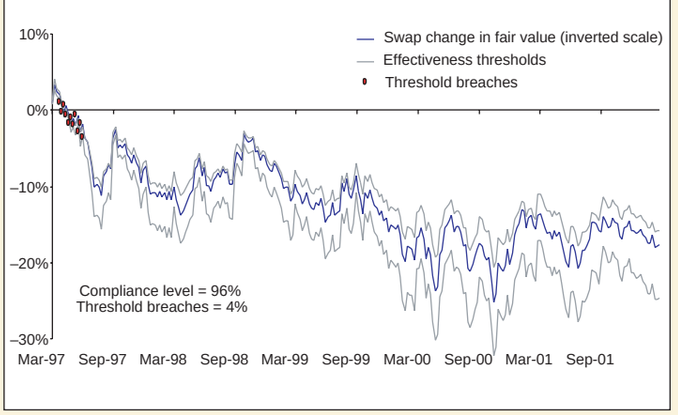
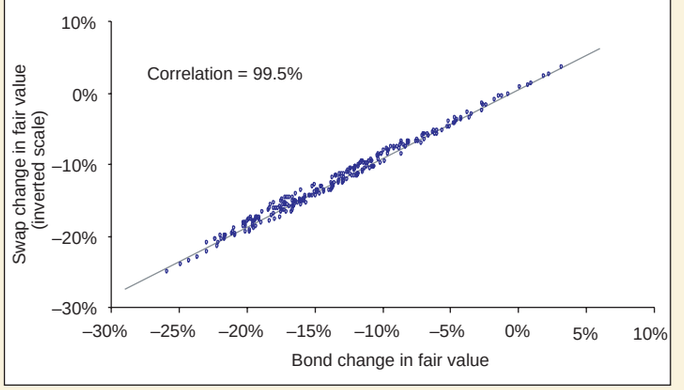


Figure 3. Regression test scatter chart



A case study: applying HEAT

A European corporation wanted to hedge the interest rate risk and forex risk on a foreign currency bond issue. In addition to designating the hedge and documenting the hedging objectives, the company must conduct effectiveness tests on an ongoing basis. This includes a retrospective effectiveness test to demonstrate that the hedge has actually been highly effective in the past, along with a prospective test to show that it is expected to be highly effective in the future. Here we describe a retrospective test conducted in February 2002 towards the end of the hedge.

The underlying hedged item is a GBP 100 million five-year fixed-rate bond with a coupon of 7.29% issued on March 5, 1997 and maturing on March 5, 2002. The designated risk is defined as follows:

- ☐ Performance metric: fair value
- ☐ Risk class: forex risk and interest-rate risk
- ☐ Amount of underlying hedged: 100% (ie, GBP 100mm)
- ☐ Desired risk characteristics: EUR 6-month Libor

The hedging instrument is a five-year cross currency swap whose receive leg has a fixed-rate coupon of 7.29% in GBP with the same terms as the bond, and whose pay leg has a floating rate coupon in EUR linked to 6-month Libor. The swap has a fair value of zero at inception. The hedge ratio is 100%, meaning that the company is hedging the GBP100 million bond with a swap notional of GBP100 million on the receive leg.

The methodology used for evaluating hedge effectiveness on this retrospective basis is defined as follows:

- ☐ Reference exposure: the underlying bond
- ☐ Fair value approach: full marked-to-market value
- ☐ Historical data to be used: actual market data for GBP and EUR interest rates (swap rates) and for the GBP/EUR exchange rate between March 5, 1997 and March 5, 2002, with a weekly data frequency

- Method of applying historical data: use actual past data directly, as this is a retrospective test
- Maturity treatment: rolling maturities for bond and swap
- Basis for comparison: cumulative changes in fair value
- Type of effectiveness test: three types of test are used: dollar-offset method, regression analysis, and the risk reduction method

To interpret the results of the tests the following effectiveness thresholds were applied:

- Dollar-offset test: ratio threshold range 80% to 125%, compliance threshold 80%
- Regression test: correlation threshold 80% to 100%
- Volatility reduction test: risk reduction threshold 40% (equivalent to a correlation of 80%)

All three effectiveness tests produce consistent pass results for this hedge, relative to the defined effectiveness thresholds. The dollar-offset test results are shown in figure 2. Over almost the entire range the actual change in fair value of the swap is within the effectiveness thresholds. In fact, the level of compliance with the thresholds is 96%. Only during the period between April and June 1997, where the changes in fair value of the underlying bond are small, are the thresholds breached. The regression analysis is shown in the scatter plot in figure 3. The tight spread of points around the regression line reflect the observed high correlation of 99.5%. Finally, the risk reduction test results are shown visually in figure 4, where it is clear the hedge provides a very high level of risk reduction of 90%. On the basis of these results, the hedge is considered "highly effective" and the swap qualifies for hedge accounting treatment.

A new paradigm for corporate risk management

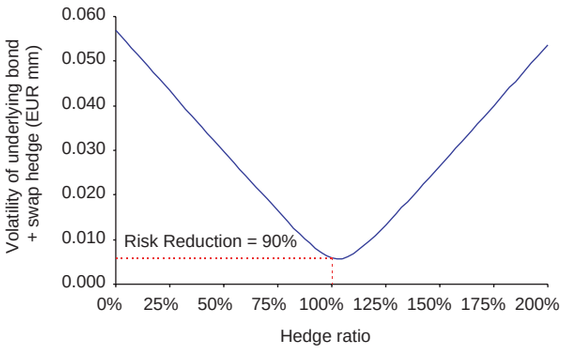
Certainly most corporations will use effectiveness tests to enable their hedges to qualify for hedge accounting treatment wherever possible. However, it is important that all corporations realise they should not necessarily avoid hedging simply because a derivative does not qualify for hedge accounting treatment, nor should they necessarily seek hedge accounting treatment for every derivative. Hedging decisions should be driven by an objective to maximise the value of the firm and must involve a balance between the true economic benefits of hedging and any accounting impact.

A growing number of European companies are coming to recognise this and acknowledge the need to divide their derivatives hedges into two distinct portfolios:

- A portfolio of accounting-compliant hedges
- A portfolio of pure economic hedges

Derivatives that qualify for favourable hedge accounting treatment, and have passed hedge effectiveness tests, fall into the first portfolio of accounting-compliant hedges. Their contribution to earnings volatility should be very low. On the other hand, derivatives that provide a real economic benefit, but for some reason do not qualify for hedge accounting treatment, fall into the second portfolio of pure economic hedges. Changes in the fair value of these derivatives will directly impact corporate earnings. These economic hedges should be monitored and managed separately, taking account of both their economic benefit and their marginal contribution to overall earnings volatility.

Figure 4. Risk reduction test result



More specifically economic hedges should be managed on a portfolio basis by defining overall limits for earnings-at-risk across the entire portfolio. In this way, the aggregate contribution to earnings volatility is controlled while the hedges are still able to deliver their economic benefits. This approach is already being adopted by some leading corporations and is very similar to the way in which banks use value-at-risk limits to control the risk of their marked-to-market portfolios.

As they become more comfortable with this approach, value-maximising firms will not avoid pure economic hedges simply because they do not get hedge accounting treatment. Instead they will take full advantage of the economic benefits, but at the same time control and manage the accounting volatility within well-defined limits.

Summary

The ultimate objective of hedge effectiveness testing is to ensure that hedging instruments are appropriate and play a valid role in reducing risk. Even if hedges are not considered effective from an accounting viewpoint, they should be effective from an economic perspective. HEAT provides a framework that helps corporations develop a consistent, practical and intuitive approach to hedge effectiveness testing, which can be applied to both accounting and economic hedges. The HEAT framework, along with the associated effectiveness methodologies, can be tailored to fit both the overall risk management strategy of each corporation and the full range of hedging situations that are relevant to that company. ■

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